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UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for

SOIL CONSERVATION SERVICE RESEARCH**

AUGUST 1947

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U. S. DEPARTMENT OF AGRICULTURE

EROSION CONTROL PRACTICES DIVISION

Contour Cultivation Saved Cotton Crop Yield in Hot Dry Season -
George W. Hood, Batesville, Arkansas.-"The weather for the month of August produced one of the most severe heat waves that this section has experienced in the past 10 years, which is as far back as we have weather records. The intense heat began during the last few days of July when 103 to 105 degrees were registered. High temperature continued for the first 10 days in August and then fell slightly and remained in the higher 90's, ranging from 95 to 99 degrees for a period of about 15 days when it again went over the 100 mark, and registered as high as 103 on several days. Along with this unprecident heat there was only .53 of an inch of rain on the 12th of the month, which was 3.54 inches below the 40 year average.

"The cotton, although drought resistant to a certain degree, is suffering greatly. The plants have made only about half the normal growth although they are heavy with bolls of good size on the contoured plots while the check plots planted with the slope will produce practically nothing. If the bolls open properly there will be a very satisfactory yield on the contoured plots in spite of intense heat and no moisture.

"This is just another example of the value of our conservation practices producing crops because of water conservation and good cultural practices."

Subsurface Cultivation Successful in Potato Production - O. R.
Neal, New Brunswick, New Jersey.-"In a 2-year rotation of potatoes and wheat, the practice of subsurface cultivation produced 267 bushels of potatoes while the yield under prevailing cultivation practices was 246 bushels. This average increase, on duplicate plots, is not statistically significant but provides some information of interest. The study has been underway for 3 years during which period the land on the subsurface cultivation plots has not been plowed. The absence of plowing, on this light-texture soil at least, has not appeared to influence yields. Since erosion control is considerably better under the subsurface cultivation practice a relative increase in yield, over that from clean cultivation, would be expected to result from continued use of the practice."

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**All Research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

Effect of Contouring On Oat Yield - Dwight D. Smith, Columbia, Missouri.-"Results of the contour oat tests for 1947 and the average yield for the 3 years that the tests have been conducted are tabulated below. The greatest yield increases were on the steepest and most permeable soils and the least on the relatively flat claypan soils.

Soil	Percent Slope	Bushels per Acre		Increase
		Up-and-down-hill	Contour	
Loring	12	30.4	43.5	13.1
Loring	8	42.0	49.9	7.9
Clarksville	9	33.6	38.7	5.1
Putnam	4	12.9	13.4	0.5
Average	8	29.7	36.4	6.7

Averages for the 18 tests during the 3-year period 1945-1947:

Contour yield	33.0 bushels per acre.
Up-and-down-hill yield	28.8 bushels per acre.
Increase by contour planting	4.2 bushels per acre.

Moldboard Plowing and Burning Induced Weed Growth and Soil Cracking Compared with Stubble Mulch Culture - Hugh C. McKay, St. Anthony, Idaho.-"The various tillage plots on the station were of particular interest this year because of the sharp contrast in the amount and vigor of the weeds present. The moldboard plowed plots and the straw burned plots had a much more vigorous stand of mustard on them than any of the stubble mulch plots. This was opposite to what is commonly thought by many of our farmers.

"Another interesting observation made this year was the difference in the cracking of the surface soil. On the moldboard plowed plots and on the straw burned plots there were cracks up to an inch wide and several inches deep. These occurred at intervals of every 6 or 7 inches. On the stubble mulch plots the cracks were hardly large enough to be noticeable.

"Seven days were spent in cooperation with the operations division during July and August."

Supplemental Irrigation - Sterling J. Richards, New Brunswick, New Jersey.-"The Laslocky pasture in Burlington County was grazed for the third time since hay was cut in June. One inch of irrigation was applied on July 23 and again on August 4 in this grazing period. The yield obtained from clipping the 18 cages showed an average of 710 pounds on the irrigated and 420 pounds on the unirrigated area. This is the first difference resulting from irrigation this season. The difference is small in relation to the total yield of over 4 tons.

"On the Snook pasture in Sussex County supplemental irrigations were applied each week in addition to the rather frequent but small rains. On a two acre, highly fertilized, renovated pasture approximately 200 cow

grazing days were obtained. The area would have produced very little, if any, grazing without the irrigation.

"To supplement the work on irrigated pastures being done in cooperation with farmers, a small area at the Vegetable Research Farm has been seeded to study the effects of supplemental irrigation on hay crops. Two seedings, alfalfa-brome and ladino-timothy, and three fertilizers, 0-10-10, 5-10-10, and 5-10-20, at 1000 pounds per acre will be studied with and without irrigation.

"One inch of water was applied to the potato plots on August 6. This amount was all that was necessary to supplement the 3.13 inches of rainfall."

Rainfall and Irrigation - T. C. Peele, Clemson, S. C.-"The rainfall on our experimental areas at Clemson for the month of July was the lowest on record. The rainfall in August was also the lowest recorded with the exception of the years 1896 and 1925. The total rainfall for the months of July and August was the lowest for these two months for any year since the rainfall record at Clemson was started 55 years ago. The rainfall on the experimental area where mulch farming tests are being conducted was 1.22 inches in July and 1.07 inches in August. While the rainfall about 3/4 mile away where an irrigation test is being conducted was 0.38 inches in July and 1.30 inches in August. The corn crop is almost a complete failure except on the irrigated area where the yield is estimated at about 140 bushels per acre. The total rainfall at the mulch farming area for July and August was 2.29 inches, while the irrigation test area received only 1.68 inches. The lowest rainfall on record for Clemson prior to 1947 was 2.71 inches for the months of July and August was 2.29 inches, while the irrigation test area received only 1.68 inches. The lowest rainfall on record for Clemson prior to 1947 was 2.71 inches for the months of July and August during the year 1925.

Gypsum block measurements of soil moisture at the 8, 18 and 24 inch soil depths in the non-irrigated area indicated that the available soil moisture was exhausted July 15 at the 8-inch depth, July 23 at the 18 inch depth and July 28 at the 24 inch depth."

Three-Year Versus a Five-Year Rotation - Orville E. Hays, La Crosse, Wisconsin.-"The type of vegetation grown on the soil is one of the most important factors affecting soil and water losses. One of the most important changes being made when a conservation plan is developed on most farms is the change from a short to a long rotation. It is often difficult to sell the farmer on more hay and less corn.

"Measurements have been made since 1940 on a three-year rotation of corn, spring grain, and one year of clover-timothy hay and a five-year rotation of corn, grain, and three years of alfalfa-brome hay. Lime and manure were applied on the corn and commercial fertilizer was applied on the grain. Phosphorous and potassium were applied at rates necessary to raise the level of fertility to 75 pounds of phosphorous and 200 pounds of potassium per acre.

"Yields of crops have been as follows:

<u>Crop</u>	<u>5-Year Rotation</u>	<u>3-Year Rotation</u>
Corn	82.6 bu.	67.1 bu.
Oats	94.0 bu.	92.0 bu.
Hay	3.4 tons	2.5 tons

"This increased yield of corn means that the same amount of corn can be grown on less acres when a five-year rotation is being followed. However, on most farms there will be a decrease in amount of corn and an increase in the amount of hay available for feed. Station records show that this increase in hay and decrease in grain need not result in a surplus of hay and a shortage of grain. The general fields at the Station are being cropped to a five year rotation. By using grass silage and feeding all the good hay the cattle will eat, there has not been a surplus of hay and there has been enough grain produced to feed the milking herd one pound of concentrate for each three pounds of milk produced. The only feed purchased is protein supplement.

"Soil and water losses are greatly reduced by cropping land to a rotation including more years of hay as shown by the following table.

<u>Crop</u>	<u>3-Year Rotation :</u>		<u>5-Year Rotation</u>	
	<u>Runoff</u>	<u>Soil Loss:</u>	<u>Runoff</u>	<u>Soil Loss</u>
	<u>Inches</u>	<u>T/A</u>	<u>Inches</u>	<u>T/A</u>
Corn	2.9	27.2	: 2.2	17.8
Grain	3.5	27.3	: 3.1	19.2
Hay	0.7	0.3	: 0.2	0.04
Average for rotation	2.4	18.3	: 1.2	7.4

Crop Rotations Reduced Runoff and Increased Infiltration - B. H. Hendrickson, Watkinsville, Georgia.-"Differences in runoff produced on certain of the Class III land runoff plots served to illustrate typical performance of good rotation practices. According to Mr. A. P. Barnett's report, the infiltrated rainfall (disregarding evaporation losses) from effective rains available to continuous cotton in August amounted to but .99 inch. Cotton in rotation following oats-lespedeza and volunteer lespedeza received 81 percent more infiltrated rainfall; the 3-year rotation average 152 percent more and the lespedeza cover crop itself almost 200 percent more. The principal point is, - that both the close-growing crop and the row crop in this rotation in August were able to utilize far more of the intense rate rainfall, than was cotton grown continuously. And during serious summer drouth conditions, this fact may often have a very important bearing on success or failure in relation to crop production."

Legumes in Rotation Pay Dividends on Iroquois County Farms (Summarized from a study carried out cooperatively by the Agricultural Economics Department, University of Illinois, College of Agriculture, and Economic Research Section of the Soil Conservation Service, U. S. Department of Agriculture) - E. L. Sauer, Urbana, Illinois. - "Corn yields averaged 11 bushels an acre higher on the farms having the highest proportion of their land in legumes compared to the average of all of the 25 record-keeping farms included in a conservation study in Iroquois County. The farms with the most legumes had one-third of their tillable land in soil-building legumes compared to only 17 percent for the average of all of the farms used in the study. Forty-one percent of the land was in corn and soybeans on the former group of farms compared to 55 percent for the entire group of farms. Oats yields were 12 bushels an acre higher on the farms growing the most legumes. Farms growing the most legumes spent \$1.75 per acre for limestone, phosphate, and fertilizer compared to \$1 an acre for all of the farms. Net farm incomes averaged \$8.74 an acre more on the farms growing the most legumes."

Conservation Farm Plans Can Be Financed (By A. G. Mueller, Assistant in Agricultural Economics, University of Illinois. - "Capital advanced for the cost of a conservation farm plan can be repaid from increased income resulting from conservation farming. Farmers have often been told that conservation farming is profitable. The questions are: "How profitable?" and "Can I afford to spend money for lime, phosphate, fencing, grass waterways, and drainage work?"

"In 1946 case studies of two Iroquois county farms were made by the Department of Agricultural Economics of the University of Illinois and the Research Division of the Soil Conservation Service. The purpose of the studies was to determine the probable returns from conservation farming on slowly permeable Clarence-Rowe soils; also to determine if credit could be advanced on a sound basis for conservation practices and repaid from increased income resulting from conservation planning. Two farms, the Werner Theesfield farm and the Marion Elliott farm in southwest Iroquois county, were selected and conservation plans were supplied by the Iroquois county soil conservation district.

"Using 1945 prices the cost of the farm plans including a complete application of limestone and phosphate was calculated. Increased yields resulting from improved rotations and fertilizer were determined and increased returns calculated using 1936 to 1942 average prices.

"Some of the important conclusions and observations of the studies on these two farms were:

1. The average cost of a conservation farm plan was from \$18 to \$20 per acre.
2. Capital advanced for the entire cost of a farm plan including interest charges can be repaid from increased earnings in six to nine years after starting the plan.

3. Returns on capital invested in complete conservation plans will produce an average return of 14 to 24 percent annually for the first 10 years.

Nitrogen Applications Affect Lespedeza in Mulch Rotation - T. L. Copley, Raleigh, North Carolina.-"Our surface mulch experiment includes a two-year rotation of corn, wheat and lespedeza under mulch tillage. Three levels of nitrogen are used on both corn and wheat. There are some outstanding differences noticeable in the amount of lespedeza this summer, following different rates of nitrogen. Total yields and computation of the hay has been determined, and the figures are given in the following table:

HAY YIELDS - NITROGEN LEVEL PLOTS OF STUBBLE MULCH EXPERIMENT, 1947
(Average of three replications)

	Total Yield lbs/Acre	Grass %	Weeds %	Lesp. %
Low Nitrogen (20 lbs. on corn, 15 lbs. on wheat)	2783	7	20	72
Med. Nitrogen (50 lbs. on corn, 30 lbs. on wheat)	2467	18	22	61
High Nitrogen (80 lbs. on corn, 45 lbs. on wheat)	2288	62	19	19

"Following heavy applications of nitrogen on corn and wheat, lespedeza seems to be suppressed, and volunteer crab grass predominates. Following low nitrogen, however, the situation is reversed and lespedeza predominates and reduces the proportion of grass to only 7 per cent of the total. The growth of wheat on the high nitrogen was not sufficient to make such difference in the stand or growth of lespedeza. Apparently, the 45 pounds of nitrogen were not all used by the wheat and a portion remained to affect both the grass and lespedeza."

Corn Grew Better After Sweetclover Green Manure Than After Grass-Legume Meadow in Dry Year - Dwight D. Smith, Columbia, Missouri.-"Corn that has suffered the least during the dry and hot month of August has been that following the plowing under of sweet clover as green manure. This corn (Series III) received 100 pounds per acre of 8-8-8 fertilizer in the row and 400 pounds on the plow sole. Its condition is superior to corn following a grass-legume meadow receiving 100 pounds of 10-20-10 fertilizer in the row and either 300, 500, or 700 pounds per acre of the fertilizer on the plow sole."

More Grazing Produced Where Sweet Sudan is Planted in 40-Inch Rows Than Where it is Planted in 10-Inch Rows - C. J. Whitfield, Amarillo, Texas.-"Sweet sudan, planted June 10, 1947, has furnished grazing since July 16. Three-fourths of the area was seeded in 10-inch drill widths. One-fourth of the area was planted in 40-inch listed furrows. The cattle, from the beginning, have shown a preference for the row-planted area over the close-drilled area. This preference is undoubtedly due to the lush growth of the wider spaced rows in comparison to the droughty condition of the close-drilled area."

"Clippings, made from an enclosure covering both areas, have shown quite a difference in green forage production. The 40-inch rows have produced 53 percent more forage than the 10-inch drill spacing. Clippings were made July 30, August 12, and August 29.

"The total rainfall on the area from seeding date, June 10, to August 29, has been 2.65 inches."

Location Versus Amount of Manure in Relation to Soil and Water Loss - G. R. Free, Marcellus, New York. - "Soil and water losses from the plots of the manuring experiment for the storm on July 18, as given below, emphasize the fact that the location of manure, and probably of crop residues also, is of far greater importance than the amount. These plots are on a 17-percent slope, and the crop this year is peas. (July Report)

Treatment	Relative Soil Loss	Relative Runoff
Low rate turned under ¹	100	100
High rate turned under	86	78
Low rate as top dressing	24	47
High rate as top dressing	4	46

1/ Low rate and high rate, respectively, mean 10 and 20 tons per acre of manure per 3-year rotation with application of 6 and 12, respectively, for corn and 4 and 8, respectively, for peas.

Density of Vegetation in Creosote Belt of Rio Grande Valley Not Affected by Nearness to River - D. S. Hubbell, State College, New Mexico. - "In connection with the study of lateral arroyos, the vegetation survey was resumed. During the present season this survey has comprised the taking of samples across the rio Grande Valley at approximately 15-mile intervals. Last year the samples were taken in a line approximately parallel to the river. Some of this year's data have been worked up and compared with last year's. In a section north of Hot Spring, New Mexico, the line of samples parallel to the river showed a total shrub density of 13.90 percent and a total grass density of .375 percent. Similar data for the line of samples approximately perpendicular to the river were 14.38 percent and .270 percent. These data are remarkably close and indicate the adequacy of sampling and a surprising homogeneity of vegetation in the creosote belt of the valley. This homogeneity is further indicated by the fact that plotting of total shrub density and density of creosote bush (*Larrea divaricata*), the most abundant shrub, against distance from the river gave no correlation. Height of creosote bushes on the line of samples parallel to the river averaged 76.30 cm. for 817 plants; 676 plants of this species on the cross sections thus far measured had an average height of 78.44 cm."

Fertilizer Treatment of Pasture Increased Beef Production -

Harley A. Daniel, Guthrie, Oklahoma.-"On August 17, the steers were removed from the pastures on the Guthrie station. They were put in these pastures on April 29, thus, the total grazing period was 111 days. The gains they made are as follows:

<u>Pastures</u>	<u>Pounds Per Acre</u>
Cleared Virgin Land	64.7
Regrassed Eroded	35.6
Regrassed Formerly Cultivated Eroded Land (Fertilized)	85.6

"The fertilizer used on the pasture consisted of 300 pounds of 20 percent super-phosphate, per acre, and 150 pounds of calcium cyanide. The fertilizer was applied just prior to the beginning of the grazing period. The fertilized pasture produced 50 pounds per acre more beef than the untreated regressed eroded pasture."

Wheat Yields in Relation to Tillage Practices - A. E. Lowe,
Garden City, Kansas.-"The 1947 wheat plot yields for the basin projects plots were determined during August. The hot-dry winds of June had shriveled the wheat and the test weights ranged from 50.9 pounds per bushel to 55.8.

"The yields for 1947 were about in line with former years though about 10 bushels per acre more than the best previous year. The 1947 yields are given in an accompanying table. This table also contains the averages of all the years this experiment has been conducted.

Table I. Annual and average grain yields of winter wheat produced by various cultural treatments on one year fallow on Basin project at Agricultural Experiment Station, Garden City, Kansas.

Cultural Treatment	Bushels grain per acre		
	1947	7 yr. Ave.	4 yr. Ave.
44" Basin list on contour	:41.4 :	24.9	: 26.6
44" Ordinary list on contour	:39.5 :	24.8	: 26.7
44" Basin list up and down slope	:37.2 :	22.4	: 24.3
44" Ordinary list up and down slope	:37.9 :	21.1	: 24.0
30" Basin on contour	:47.0 :	26.2	: 29.4
30" Basin up and down slope	:36.7 :	28.7	: 24.7
One-way on contour	:43.4 :	25.5	: 28.7
One-way basined on contour	:42.1 :	24.4	: 27.9
Good Farm Practice (basined on contour)	:44.8 :	24.7	: 28.2
Trashy fallow on contour (straight blade or large sweeps)	: : :44.4 :	: 21.6	: 28.0

"Contouring for a seven year period has given a 14.5% increase over non-contouring. The 30 inch basining on the contour has the highest average yield of any method."

"Trashy fallow during the last four years when its yields were comparable to other methods is neither much higher nor lower in yield than the other methods."

Tillage Methods in Relation to Saw-Fly Infestation of Wheat - Carl L. Englehorn, Fargo, North Dakota. - "During the first week of August the wheat stem saw-fly, *Cephus cinctus*, was noticed in the wheat of the tillage plots at Edgeley, North Dakota. This insect had not been seen here before; this was the first reported occurrence in LaMoure county though infestation has been heavy in the northern and western parts of the State during the past few years.

"Since the larvae of the saw-fly remain over winter beneath the ground surface in the basal internode of the wheat stem, survival and emergence of the adult form may be affected by the type of tillage to which the field is subjected subsequent to harvest of the crop. Turning under of the stubble by means of the moldboard plow is considered to be an effective means of control in that this tends to prevent emergence of the adult in the spring."

Table 1. Saw fly larvae population in terms of the percent of infested wheat stems as it may be affected by the type of spring tillage used for seedbed preparation under continuous wheat. Edgeley, North Dakota. August 14, 1947.

Tillage Method	Percent of Infested Stems			
	At field margin	1/3 distance across field	2/3 distance across field	Average
2 Ton straw, stubble				
mulch tillage	8.0	4.0	1.3	4.4
Stubble mulch tillage	6.7	4.0	2.7	4.5
Moldboard plow	8.0	1.3	4.7	4.7
Burn residue	12.0	8.0	0.0	6.7
Disk	26.7	9.3	4.0	13.3
Field Cultivator	32.0	5.3	4.0	13.8

"That the highest infestation occurred at the plot margins would indicate that the source of infestation was largely from without the plot area, in which case the differences between plots may not be of great significance. However similar counts made on field plots at Stanley, in the north-western part of the State where the degree of infestation is much greater, indicate similar trends. There the average percent of infestation was 57 on stubble mulch fallow and 82 on fallow tilled with the oneway disk. In the adjacent area under continuous cropping to wheat, spring stubble mulch tillage showed an average infestation of 72 percent, tillage with the oneway disk 88 percent, and with the moldboard plow 94 percent.

"These observations indicate that stubble mulch tillage has not been more condusive to saw-fly infestation than has plowing. Further counts are being made in the Stanley area in order to determine the relationship between tillage and fly infestation."

Residual Effects of Erosion at Geneva - E. A. Carleton, Geneva, New York.-"Wisconsin hybrid field corn, No. 275, planted on the control plots June 7, and fertilized at the rate of 1,000 pounds of 10-10-10 per acre has shown growth characteristics indicated in the following table:

Average height of corn and growth rate in relation to previous cultural practices and soil lost by erosion.

Plot No.	Height of corn		Growth per day	Cultural practices 1936-1946	Soil loss 1936-1946
	July 11	July 29			
	Inches	Inches	Inches		Tons an acre
5	10	36	1.4	Fallow	200
2	10	40	1.7	Winter rye	77
1	14	57	2.4	Soy beans, fall plowed	7
3	13	56	2.4	Buckwheat sown in trash	9
4	13	55	2.3	Soybeans, sown in trash	11
6	14	58	2.4	Bluegrass sod	-
7	7	15	0.4	Fallow	352
8	9	33	1.3	Vegetable crop rotation	31

"Soil and water losses at Geneva, given in the following table, were from the high-intensity rain of July 27. The plots were all in corn. There was 0.31 inch less rain at the Dunkirk plots than on the Ontario.

Plot No.	Ontario sandy clay loam, 8% slope, rainfall 1.06"		
	Water loss	Precipitation	Soil Loss
	Inches	Per cent	Pounds an acre
5	0.564	53.2	4568
2	.445	42.0	2058
1	.318	30.0	1470
3	.080	7.5	339
4	.095	9.0	519
6	.006	0.6	40

Dunkirk silty clay loam, 5% slope, rainfall 0.75"

7	.113	15.0	710
8	.037	5.0	102

(July Report)

Residual Effects of Past Treatment on Corn Growth, Soil Organic Matter and Erosion at Marcellus - G. R. Free, Marcellus, New York.-"The data in the following table show that the difference in corn heights are considerably less marked in 1947, following one cycle of a 4-year rotation of corn, oats, and 2 years of hay, than in 1943. Color differences have also been much less marked than before. Only normal applications of manure and superphosphate have been made." (August Report)

Cultural Practices 1939-1943	Soil loss 1939-1943 <u>Tons an acre</u>	Height of Corn 7/28/43 <u>Inches</u>	Height of Corn 7/31/1947 <u>Inches</u>
Meadow	1.3	48.8	47.2
Fallow	269.9	32.0	42.9
Difference		16.8	4.3

"Samples from these plots have been analyzed for organic matter by Mr. E. A. Carleton with the following results:

Plot	Cultural Practices 1939-1943	Organic matter Spring 1943 <u>Per cent</u>	Fall 1946 <u>Per cent</u>	Change in Organic matter <u>Per cent</u>
A-1	Meadow	2.54	2.52	-0.02
A-4	Meadow	2.63	2.69	+ .06
A-2	Fallow	1.95	2.07	+ .12
A-3	Fallow	2.01	2.25	+ .21

Soil And Water Losses on Corn Land Following Varied Past Land Management Treatments for Six Storms in August at Geneva - E. A. Carleton, Geneva, New York.-

Plot	Soil	Previous Treatment 1936-1946	Present crop 1947	Runoff ¹ <u>Percent</u>	Soil loss an acre <u>Tons</u>	Average daily increase corn height 7/11/47-8/11/47 <u>Inches</u>
1	Ontario	Soybeans fall plowed	Corn	34	3.9	2.6
2	Ontario	Winter rye	Corn	54	5.8	2.3
3	Ontario	Buckwheat sown in trash	Corn	28	4.4	2.7
4	Ontario	Soybeans sown in trash	Corn	41	10.3	2.8
5	Ontario	Fallow	Corn	69	12.7	2.0
6	Ontario	Bluegrass sod	Corn	11	0.1	2.7
7	Dunkirk	Fallow	Corn	45	5.4	1.1
8	Dunkirk	Vegetable crop rotation	Corn	32	2.3	2.1

^{1/} Precipitation for six storms at Ontario plots - 5.41 inches; at Dunkirk plots - 5.19 inches.

"The losses reflect previous treatment.. Highest loss of soil and water was from plot 5 which had been clean cultivated for 10 years previous to planting corn. The least loss was from plot 6 in bluegrass sod for 10 years previous to planting corn.

"The data on rate of corn growth given in the last column also reflect the effect of past management and losses of soil and water.. Fertilizer used was 10-10-10 at 1,000 pounds per acre." (August Report)

Liming Farm Ponds at the Arnot - John Lamb, Jr., Ithaca, New York.-"The new pond at the Arnot filled April 1947, and failed to clear properly. This month, an acidity test was made which showed a pH of 6.5. Hydrated lime was spread over the water at the rate of 500 pounds per acre. The water cleared within a week. Following this, 8-8-4 fertilizer was applied at intervals of a week. So far, 300 pounds of this fertilizer plus the lime has resulted in a growth of plankton which is as good as we ever obtained with 1,000 pounds per acre of fertilizer without lime.

"Apparently, many of the ponds made on acid soils will not clear or grow fish food properly unless they are limed. If you have a pond that is a problem, and want to try a simple experiment, write our office for suggestions." (August report)

Method of Seedbed Preparation and Crop Yields at Marcellus - G. R. Free, Marcellus, New York.-"Data from this experiment have not been fully calculated and analyzed, but it is apparent that the three methods of seedbed preparation--ordinary turn-plowing, subsurface plowing, and discing -- had marked and significant effects on yields of wheat. For example, one comparison with each yield being the average of data from nine plots, shows 29.5 bushels per acre for turn-plowing; 24.9 for subsurface plowing; and only 19.4 for discing. Observations of the present vigor and stand of seeding of hay species made on the wheat in the spring indicate that some of the highest yields of wheat are associated with a poorer stand of hay. For this reason, final evaluation of method of seedbed preparation cannot be made until hay yields are determined next year.

"In another experiment at the Marcellus station, where alfalfa was seeded in 1946 following an old timothy sod and using the same three methods of seedbed preparation, except that the turn-plowed plots were given a light application of straw after seeding, yields of dry matter from second cutting this year were 1.14, 0.94, and 0.88 tons per acre, respectively, for turn-plowing, subsurface plowing, and discing." (August Report)

Kind and Abundance of Weeds in Relation to Tillage Treatments of Summer Fallow - Torlief S. Aasheim, Bozeman, Montana. - "As a result of being absent from Culbertson all during the month of July a good many of the fallow plots got very weedy before they were cultivated. Continued wet weather during August added to the delay. The oneway and sub-surface tilled plots were much weedier than fallow which had been mold board plowed. The delay in cultivation of all fallow provided an opportunity to observe definite differences in the kind of weeds which grew on the fallow prepared by different methods. On subsurface tilled plots green foxtail (*Setaria viridis*) predominated nearly to the exclusion of other weeds, wild buckwheat (*Polygonum convulvulus*) was present to some degree. On oneway fallow the red root pigweed (*Amaranthus retroflexus*) was the weed most prevalent and on mold board plowed fallow the Russian thistle (*Salsola pestifer*) was present to a greater extent than any other weed. Similar observations have been made in the past and this indicates that a combination of the oneway and subsurface tillers or the oneway and rod weeder may be more effective for weed control than the exclusive use of one or the other. Care must of course be used in using the oneway as it does create an erosion hazard if improperly and excessively used."

DRAINAGE AND WATER CONTROL DIVISION

Hydrologic Studies - W. D. Ellison, Washington, D. C.-"Agricultural Engineering" for August carried Mr. Ellison's paper entitled "Soil Erosion Studies - Part V (Soil Transportation in the Splash Process," pp. 349-351, 353.

Hydrologic Studies - L. L. Harrold, North Appalachian Experimental Watershed, Coshocton, Ohio.-"Rain of 3.65 inches fell on 8 days. The first significant rain fell on August 14. During the 20-day period prior to August 14, only 0.43 inch of rain fell. This is a season of great water demand by growing crops. About 4 or 5 inches of water was used in this period. This about exhausted the available water. A few more dry days would have seen the corn leaves curl. Rain of 0.42 inch on August 14 and 2.06 inches on August 16 saved the crop as much of it went into the ground. Straight-row corn yielded 0.88 inch runoff, contour corn 0.15 inch, and mulch corn 0.0005 inch runoff for the month.

"Soil moisture on the corn plots are given below:

Table 1.--Soil moisture data, plots in E, F, G, (corn)

Sampling date	Soil depth	Plowed	Plowed (without moldboard)	Disked
1947		Percent	Percent	Percent
April 8 ^{1/}	0-7	24.2	24.5	26.4
	7-14	21.3	22.6	21.7
June 27	0-7	19.4	18.8	20.2
	7-14	17.4	18.3	17.1
August 4	0-7	13.3	15.6	15.1
	7-14	15.2	16.1	15.2
August 28	0-7	16.7	18.8	19.0
	7-14	17.1	16.8	18.1

^{1/} Before tillage for corn.

"Laboratory work was continued on the study of soil permeability. Soil cores were obtained in the subsoil at watershed 109 and at various depths on watershed 123. The results obtained on watershed 123 appeared to be very erratic due to the peculiar soil structure of the Keene silt loam. It was observed that in many cases the soil sampler destroyed the structure in pounding the sampling tube into the soil. When this occurred, water ran along the cracks produced, giving excessively high transmission and percolation rates. In a very few cases where this structure was not destroyed, rates were considerably lower and appeared to correlate fairly well with rates of watershed performance. Thus, there was a large variation in percolation rates of the subsoil in the Keene silt loam. A new method of obtaining samples is now being investigated and further progress will be reported."

Hydrologic Studies - R. B. Hickok, LaFayette, Ind.--"August rainfall was slightly above the probable normal for the locality. A rain on August approximately 1.8 inches, produced substantial runoff from prevailing treated watersheds in both corn and soybeans; whereas, there was little or none from those under the conservation treatment. Lesser storms on the 14th and 25th produced similar results.

"Wheat samples were threshed and weighed. The following table shows comparative yield data for the individual watersheds:

Table 1.--Comparative^{1/} wheat yields from experimental watersheds, Purdue-Throckmorton Farm, 1947.

Treatment	Wsd. No.	Yield, Bu./Acre
Prevailing	10	30.3
	15	23.5
	Average	26.9
Conservation	18	28.6
	14	25.2
	Average	26.9

^{1/}Yields not corrected to standard moisture, averages of 0.005 acre samples at 50' x 50' intervals.

"There was no effect of treatment differences on the yield. This is in contrast to previous years' results. It is the first year that wheat has followed beans (instead of corn) on the watersheds and the first year that no nitrogen was applied as a spring topdressing of either manure or chemical fertilizer. The conservation-treated wheat was contour drilled, with 400 lbs. of 0-14-7 drilled with the seeding. The prevailing treated wheat was drilled in straight rows with 150 lbs. of 0-14-7. Seed bed under both treatments was prepared by disking of soybean stubble and straw, with considerable residue remaining on or near the surface. There was very little runoff during the fall and early spring from either the prevailing or conservation-treated watersheds, probably due in part to this residue."

Hydraulic Studies - W. O. Ree, Stillwater, Okla.--"Among the experiments performed during the period was an 8-flow experiment conducted on Channel F04 (medium length green Bermuda cover). This experiment will be discussed in some detail in order to compare it with a similar experiment run on this channel in 1946. The earlier experiment was reported in the July 1946 report.

"At the time of the 1946 tests the channel had a small bare watercourse in its bed. During the highest flow, which reached a velocity of only 4.8 feet per second, considerable scour took place in and around this defective section. It was concluded from last year's tests that the permissible velocity in this channel was about 4 feet per second, or about half that of a channel with a good uniform cover. During the following winter the damaged portion of the channel was repaired and allowed to completely heal over. The repairs were effected by solid sodding the bad breaks and topsoiling and sprigging the lesser eroded areas. Very little water was discharged down the channel until the 1947 tests were run.

"The 1947 tests, which duplicated the 1946 tests as closely as possible were run mainly to check the effectiveness of the repairs and to see if there was any increase of the permissible velocity. At the time of these tests the cover in the channel was principally a medium length green Bermuda grass. The cover was complete with no breaks or large bare areas. The cover in 1947 was slightly less dense and a little longer than in 1946. The composition had changed some. There was considerable triple awn where there had been little or none last year. The appearance of this poorer grass in the channel was rather unexpected. It is generally found on the poorer land. Possibly nutrients had been leached out of the channel bed by the many test flows to the point where a good Bermuda grass cover could no longer be supported.

"The 1947 tests had practically no effect on the channel. No measurable scour took place and the channel was still in excellent condition. The highest velocity reached 4.3 feet per second. This was not much less than that reached in 1946. It is believed that the channel would have easily withstood a velocity of 8 feet per second. This figure is based on other tests on similar covers.

"The 1947 vegetation was a little longer than the 1946 and as a result had a higher retardance value. The results of the last four years' tests are given in the following table:

VR	Mannings n			
	1947	1946	1945	1944
0.065	0.31	0.24	0.24	--
.111	.34	.23	.22	0.18
.243	.21	.15	.14	.13
.474	.13	.096	.095	.094
.844	.090	.073	.072	.074
1.48	.066	.055	.054	.058
2.42	.053	.045	.045	.050
3.45	.045	.040	.039	--

"These data show the 1947 cover to fall in retardance group C while the 1946 cover was in group D. This difference is attributed to the difference in cover length."

"The effectiveness of proper maintenance of a waterway is illustrated by this experiment. It took but little effort to fix up the channel yet its permissible velocity was doubled."

Supplemental Irrigation Studies - J. R. Carreker, Athens, Ga.-

"Soil moisture conditions were fairly good during the first 3 weeks of August due to several showers. Hot, dry weather the latter part of the month, however, created a need for irrigation the first of September.

"Harvesting okra and tomatoes was continued throughout the month. Harvesting string beans was completed August 27, with the first harvest date being July 28. Each plot record was taken from 3 rows spaced 3.5 feet apart by 100 feet long. The record of beans harvested from 4 irrigated and 4 unirrigated replicates was:

<u>Irrigated</u>			<u>Unirrigated</u>		
<u>Plot No.</u>	<u>lbs/plot</u>	<u>lbs/ac.</u>	<u>Plot No.</u>	<u>lbs/plot</u>	<u>lbs/ac.</u>
9	138.3	5,737.5	17	85.1	3,530.5
10	163.5	6,783.0	18	87.4	3,625.9
11	127.6	5,293.6	23	79.3	3,289.8
12	135.9	5,637.9	24	64.6	3,094.9
Average	141.3	5,862.0		81.6	3,385.3
	- 81.6	- 3,385.3			
Increase	59.7	2,476.7			
$59.7/81.6 \times 100 = 73.2\%$ increase due to irrigation.					

Costs of irrigation and other analyses have not been made to date.

"The irrigated pasture continued to carry twice as many heifers as the unirrigated pasture. The stand of grass and clover in the irrigated pasture was much more dense than in the unirrigated pasture.

"There is a much higher indicated corn yield on the irrigated than on the unirrigated plots."

Drainage Studies - M. H. Gallatin, Homestead, Fla.-"Samples taken from our mulch plots, in connection with our nitrate studies, were analyzed. There was little or no difference in the pH for the various plots but there was a marked difference in the available nitrates in the various types of mulching materials. The following are the results: Natural growth 4.4 parts per million, shavings 6.7 p. p. m., check 5.2 p. p. m., pine straw 28.1 p. p. m., and the grass plot 43.8 p. p. m. From the data it will be noted that there is a direct correlation between the amount of nitrates available and type of material. These plots have been in operation about a year. Nitrates were run when these plots were started and it ran about 4 to 5 p. p. m. for all the plots.

"Data to date show that when the shaving mulch begins to dry out it takes longer and more rain to change the moisture readings as it does for the pine straw or grass mulched areas. Shavings have a tendency to shed water."

Sedimentation Studies - L. C. Gottschalk, Washington, D. C.-"Work has been started on an annotated and classified bibliography of sedimentation. This bibliography is being prepared under the sponsorship of the Sedimentation Subcommittee of the Federal Interagency River Basin Committee. Material for the bibliography was assembled between 1938 and 1942 in cooperation with the Works Projects Administration. During this period over 110,000 separate engineering magazines, books, reports, etc., were reviewed in search of information relative to sedimentation. Over 4,000 articles and reports on sedimentation were found and abstracted. The present work includes a review of the abstracted material, selection of abstracts representing the more important literature on sedimentation, and editing and classifying the material for the bibliography.

"C. B. Brown spent considerable time in assisting Gunnar M. Brune, of the Milwaukee, Wisc., regional office, in preparing a report entitled 'Rates of Sediment Production in Midwestern United States.' This report summarizes all of the suspended-load and reservoir sedimentation data in the Ohio and Upper Mississippi and Great Lakes drainage basins. An analysis of the data is included, together with tables and graphs which may be used for estimating sediment production rates for given areas and conditions."

IRRIGATION DIVISION

Storage of Water Underground (Water Spreading) - Dean C.

Muckel, Pomona, Calif.-"Because the test strips of the Madera plot all took water at very nearly the same rate over a period of several weeks a new program of operation was worked up whereby some of the strips would be given a period of drying. These strips are on a Hanford soil and the percolation rate has been constant and approximately equal on all strips at 0.7 foot per day. At the Kern County tests on Exeter and Hesperis soils the percolation rates varied considerably with different treatments and in all cases showed considerable fluctuation and decreases with the continued application of water. The Madera strips have been treated by cultivation, additions of cotton bolls (very effective in Kern County), corn stalks with and without ammonium sulphate and different types of grasses. Explorations were made of the subsoil and a very dense hard strata was found at a depth of 10 feet below the surface. Soil samples were taken in and near the strips showed that this strata was apparently not affecting the infiltration rate as there was saturated soil only a few inches above the strata.

"By special request from the City of Los Angeles Water Department a reconnaissance survey was made of Owens Valley with the purpose of determining if spreading of surface water could be accomplished to the benefit of the ground-water supply in the vicinity of certain wells. It is proposed to spread water from one creek on an experimental basis and to follow the movement of the added water by a series of observation wells. Ordinarily, the surface flow in the valley is sufficient to meet the requirements of the Los Angeles aqueduct, but in dry periods this surface flow must be supplemented by pumping from wells. A time lag of about 10 years is expected from the point of spreading to recovery by wells."

A. T. Mitchelson, Berkeley, Calif.-"There is growing concern regarding suggested activities of the Division of Sanitation, California Department of Public Health, with reference to recharging ground-water basins by means of wells. The Division has stopped this practice in one or two cases where surface water was being added directly to the ground-water supply demanding that the surface water be chlorinated or otherwise sterilized before coming in contact with ground water used for domestic purposes. They feel that there should be no objection to surface spreading where the water is percolated and filtered for considerable distances through sands or soils and where domestic supply is not extracted from the immediate area of the spreading works. A meeting was held in the Berkeley office sometime ago, attended by members of the Division of Sanitation, the Bureau of Reclamation, and the Division of Irrigation. Another meeting is to be called after the Division of Sanitation has thoroughly studied field practices in water spreading."

Irrigation Enterprises Study - Wells A. Hutchins, Berkeley, Calif.-

"This is a study of irrigation enterprises in the Western States, being made in cooperation with the Bureau of Agricultural Economics, the primary purpose of which is to determine the adaptability of various types of irrigation enterprise organization to situations that will be met in future development. The field work, which was completed during the fiscal year ending June 30, 1947, covered 53 irrigation enterprises, of which 2 were covered by both mutual company and district organizations, making a total of 55 different irrigation organizations. These organizations comprised 28 districts, 17 mutual irrigation companies, and 10 commercial irrigation companies. The district group is

further subdivided into 24 irrigation districts, 1 water district, 1 electrical district, and 2 public power and irrigation districts.

"After the completion of the progress report, it is planned to prepare, for publication, a bulletin on types of irrigation enterprises."

Drainage Studies, Imperial Valley - "A Brief summary of a recently completed manuscript entitled 'Tile Effluent Measuring Devices' by William W. Donnan and George B. Bradshaw, is as follows:

"Two effluent measuring devices were developed primarily for use in analyzing the efficiency of installed tile systems. The first device is called a tile stick and is used to measure flow from tile outlets. Designed on the principle of the Clauson Pierce weir stick, this measuring device utilizes the velocity head of flow in the tile lip to indicate the volume discharged. The authors have developed sets of curves for various tile outlet sizes and indicate how to utilize the stick to secure data on the installed tile systems. The second device is called the continuous flow recorder. A sensitive Friez water-stage recorder is mounted on the top of the tile outlet and the recorder pen is activated by a light paddle float suspended in the lip of the tile outlet. Scale drawings and photographs describe this instrument which is used to record the fluctuations in discharge due to irrigation, seepage or rainfall."

Salton Sea: "Salton Sea is used as a storage reservoir for runoff and drainage water from irrigated lands in Imperial Valley. Since in recent years the water level of the Sea has been rising, an evaporation station was installed at the request of the District. George B. Bradshaw reports that the average evaporation for July was 0.60 inch per day from a Weather Bureau pan."

Irrigation Practices - V. S. Aronovici, Pomona, Calif. - "Irrigation efficiencies were measured on a corn and blackeye-bean field. Measurement of water applied was made by means of the 12-inch Sparling meter. Pre-irrigation and post-irrigation moisture sampling was made 110 feet from the head ditch in the center of three furrows and two ridges. Similar sets were taken 320 and 530 feet from the head ditch. The soil is sand to loamy sand to a depth of 3 feet. Below the texture is somewhat heavier. This causes some decrease in the percolation rate and appears to increase materially the field capacity of the overlying sands. Below is tabulated the inches of water gained by an irrigation application of 4.55 acre-inches per acre:

Distance from head ditch feet	Gain in soil moisture				
	Furrow inches	Ridge inches	Furrow inches	Ridge inches	Furrow inches
110	2.31	1.55	1.69	1.92	1.70
320	4.04	3.31	2.92	3.60	3.37
530	1.73	1.35	1.72	1.22	3.72

"Taking a direct average of the first two ridges and furrows a gain of 2.28 inches was measured. Adding an estimated consumptive use rate, for a 48-hour period between the pre- and post-irrigation sampling, of 0.40 inch, the total soil moisture gain was 2.48 inches. This gives a field irrigation efficiency of 85 percent. As there was very little waste water, the degree of efficiency was the result of deep percolation and evaporation."

Silt Studies of Streams in Texas - Dean W. Bloodgood, Austin, Texas.-"The largest amount of silt carried by Texas streams was recorded at the Richmond station on the Brazos River. During a 22.3-year period it amounted to 566,496 acre-feet which would have been sufficient to have reduced the storage capacity of some of the larger sized storage reservoirs of Texas, such as Lake Possum Kingdom (Brazos River), capacity 730,000 acre-feet; and Lake Buchanan (Colorado River), capacity 992,475 acre-feet. During the water-year 1945-46, it amounted to 23,275 acre-feet. The amount of silt passing the Richmond station during this long period ranged from 9,668 acre-feet to 63,824 acre-feet. The average acre-feet of silt per year per square mile of contributing watershed was 0.730 and the average percentage of silt by weight was 0.474. Other large amounts of silt carried by Texas streams occurred at the Rockland Station on the Neches River, and amounted to 5,539 acre-feet during 16.1-year period. At the Romayor station on the Trinity River, it amounted to 49,911 acre-feet during 10.1-year period. At the San Saba station on the Colorado River, it amounted to 52,001 acre-feet during 16.0-year period."

Rice Irrigation Studies, Texas - Dean W. Bloodgood, Austin, Texas.-"Summary of an old report was mimeographed during July 1947 on 'Investigation of Irrigation of Rice under Neches Canal in Jefferson County, Texas, in 1926' by R. G. Hemphill and R. G. West. While this report is old, most of the information and data are applicable to present conditions for that particular area."

Water Application and Water Requirement Studies - J. C. Marr, Boise, Idaho.-"At the request of the Soil Conservation Service Regional Office at Portland, Ore., Mr. Criddle conducted a number of studies during the past year or so on water application. The aim of this work is to determine the proper rate of irrigation for different slopes and soil conditions in order to assure even distribution of water and to prevent erosion. During the month of July Mr. Criddle prepared and submitted the following reports on these studies:

Progress Report on Irrigation Studies in Kootenai Soil Conservation District, Idaho

Progress Report on Irrigation Studies in Yellowstone Soil Conservation District, Idaho.

Progress Report on Irrigation Studies in Portneuf Soil Conservation District, Idaho.

Progress Report on Irrigation Studies in Wood River Soil Conservation District, Idaho

A Practical Method for Determining Length of Runs, Size of Furrow Streams, and Spacing of Furrows on Irrigated Land

"For several years Messrs. H. F. Blaney and W. D. Criddle have been engaged in formulating from sunlight hours and certain other meteorological data the water requirements for crops. Using this method, Mr. Criddle prepared an estimate of water requirements of crops grown in Idaho. His manuscript entitled 'Estimate of Water Requirements in Idaho' was completed during the past month and should soon be available."

R. L. Parshall, Ft. Collins, Colo., reports - "During the month full time was spent in the construction of the sand trap model at the Bellvue Laboratory. This model is built on a scale ratio of 1 to 10 and is intended to study the efficiency by means of riffle deflectors and short vortex tubes, where one compartment of the model has 6 vertical concrete cylinders which in the prototype would be 4 foot reinforced concrete pipe, one upon the other vertically to a height of about 13 feet. The other compartment is where a narrow channel, parallel sidewalls, and the short vortex tubes enter this channel, and in both cases outletted through nominal 36 inch concrete pipes."

NOTE: The above reports were inadvertently omitted by the Washington office from the July Summary of Reports. The reports that follow are for August.

Storage of Water Underground (Water Spreading)- A. T. Mitchelson, Berkeley, Calif.--"Regarding the item reported in July report (page 19 of this Summary Report) on activities of the State Division of Sanitation regarding use of surface water in recharge of ground-water supplies by means of wells, A. T. Mitchelson had a recent conference with the Chief Sanitary Engineer and reports that after some study of the practice of recharging ground-water basins, the Division of Sanitation had concluded that instead of issuing mandatory resolutions prohibiting use of wells for ground-water replenishment, the resolution would now ask the cooperation of all agencies in protecting the high quality of under ground supplies. In a meeting of a State legislative committee on ground-water supplies, the chairman refused to go along with any more that would result in the waste of any water until it could be definitely stated that the water could not be used either for agriculture, industry or domestic purposes."

Snow Surveys and Irrigation Water Forecast for Nevada - Clyde E. Houston, Reno Nevada.--"The 1947 Federal-State Cooperative Snow Surveys and Irrigation Water Forecast for Nevada was made by Division of Irrigation, SCS personnel. This is the first year that SCS personnel have made the report. Preliminary runoff data for the key gaging station of Humboldt River at Pali-sade (only record available at this date) show that the forecast was within 5 percent of the actual flow. This is very encouraging as one can see by comparing the following past records of actual flow and forecast flow:

<u>Year</u>	<u>% Diff.</u>	<u>Year</u>	<u>% Diff.</u>
1947	-5	1939	4
46	-17	38	17
45	97	37	32
44	28	36	-14
43	44	35	190
42	39	34	-84
41	55	33	-45
40	-14	32	19
		31	No record
		30	68

Water Conservation, Antelope Valley - Harry F. Blaney, Los Angeles, Calif.-"A study on irrigation and water conservation in the Antelope Valley Soil Conservation District in cooperation with the State Engineer of California has developed some interesting facts. A report by the State indicates that under about 29,000 acres of irrigated land the depth to ground water exceeds 100 feet; the water table is now falling about 3 feet per year and pumping draw down adds 30 feet more to the pumping lift required for irrigation, and the extractions in 1947 will exceed the mean annual recharge to the ground water by more than 50,000 acre-feet. Among other things this report recommends the following:

'(1) Every effort should be made to reduce consumptive use in the valley through the substitution of higher duty crops. Studies with this end in view now being carried out by the Soil Conservation Service, County Farm Advisors and others and the efforts of influential local organizations should be continued.

'(2) Studies by the Soil Conservation Service and the University of California relative to improved irrigation practices and possible salvage of waste should be encouraged. The fact that this waste may be small does not justify neglecting it if it can be salvaged at a cost commensurate with the benefits derived.'

Drainage Investigations, Imperial Valley - William W. Donnan, Los Angeles, Calif.-"Procedures and techniques for designing tile-drainage systems in irrigated areas have been on trial for the past 18 months. Considerable success has been achieved through the use of a formula for spacing the tile lines.

"The formula was developed from measurements made of the factors in Darcy's Law ($Q = P.I.A.$). The formula has been revised as follows:

$$S^2 = \frac{4 P (b^2 - a^2)}{Q_d}$$

Where S = Spacing of tile lines (feet)

P = over-all coefficient of permeability (gal. per sq. ft. per day)

b = distance from average ultimate water table to barrier stratum at the midpoint between tile lines (feet)

a = distance from average tile depth to the barrier stratum (feet)

Q_d = quantity of water to be drained by the tile lines (gal. per sq. ft. per day)

"The Q_d factor is an estimate secured by taking a percentage (8 percent to 15 percent) of the amount of water applied to the field for irrigation. Soil borings reveal the location of the barrier stratum. Soil samples are references to an index to determine coefficient of permeability. The tile system is usually designed for a depth of 6 to 6.5 feet, with a midpoint between tile lines water table depth of 4 to 4.5 feet. The formula thus gives an approximate range of spacing for the individual problem area."

Salton Sea - George D. Bradshaw, Imperial, Calif.-"The second evaporation station has been installed at the Salton Sea. This station is located at the end of the Mecca Mud Hills flume on the north end of the sea. The data to date indicate a considerable difference of temperature, humidity, and evaporation. The station on the Southeast for the week of 8/18 to 8/25/47 indicated sharp maximum to minimum temperature and a slowly changing maximum temperature. A variation of humidity from 26 percent to 62 percent and an evaporation of 2.74 inches. These data are not conclusive but does bear out the idea that several evaporation stations will be required to give a reliable record of evaporation from the Salton Sea."

Permeability Studies - V. S. Aronovici, Pomona, Calif.-"A chart was developed whereby an estimate of the coefficient of permeability may be made for Imperial Valley sediments with texture evaluation alone. Consideration is given to the basic structures observable in these sediments. This chart was designed for use in the field so direct estimates may be made."

"A design was made of a simple portable unit for field measurement of the coefficient of permeability. The principle is based upon designs developed by C. S. Slater and others, using the Leamer-Shaw tension table. Tensions of 20 centimeters are used below the table and approximately 2 centimeters above a 5 centimeter soil column. A head is maintained on the soil core by means of independent Mariotte bottles. To prevent disturbing the soil core a second core cylinder is placed above the soil core. They are held together by means of a 1 inch wide rubber band made from a bicycle inner tube. The pilot unit now under construction is designed to carry 4 or 5 (5 centimeters in diameter) cores at one time. All equipment will be built into a small box for ease of transportation."

Evapo-transpiration - Dean C. Muckel, Pomona, Calif.-"In order to divide consumptive use along the Santa Ana River from Riverside Narrows to the Prado gaging station as determined in 1931 and 1932 into the various subdivisions of the area, as required in our current study, the original crop-survey maps were obtained and transferred to aerial photos. Consumptive use was then computed for each subdivision by means of consumptive use units previously established. It is believed that the consumptive use as calculated from 1931-32 studies will hold for the period 1928 to 1940, at which time Prado Dam was completed and caused a change of physical conditions along the river bottom."

Irrigation Studies - George D. Clyde, Logan Utah.-Barrett reports-"Revisions to Utah snowmobile No. 1 are complete. Machine is ready for field trials. Weight is still greater than desired. After 1948 field tests it is believed that by using lighter materials the over-all weight can be reduced to 1,000 pounds."

Fuhrman reports-"Preparation of a summary of all past snow-survey measurements in Utah, and brief histories of Utah snow courses has been completed during the month and will be distributed in September. In the compilation of this material, all back records have been carefully checked and errors eliminated. Much of the data on snow-course histories has never before been compiled or made a matter of record, and it is felt that the material presented will be valuable to all of the Utah people concerned with irrigation."

Lauritzen reports-"A manuscript entitled 'Apparent Specific Volume and Shrinkage Characteristics of Soil Materials' was accepted for publication by SOIL SCIENCE and will be published in the December issue.

"Routine observations on the experiment linings in Channels A and B were continued. Work was continued in connection with the stock piling of material and the preparation of the channel for the installation of linings in Channel C. Plans and specifications for six additional channels at the River Laboratory were prepared. The channels will be trapezoidal with side slopes 1-1/2 to 1 and have a range of grades such that velocities of approximately 1, 2, 3, 6, 9, and 12 feet per second will be attainable.

"A study of stability of compacted earth materials when used as linings for canals has been summarized in report form.* Five types of linings were studied as follows:

1. Mendon silt loam
2. Oasis silt loam
3. Trenton sandy loam / 10% bentonite
4. Trenton sandy loam / 5% bentonite
5. Trenton sandy loam

"The materials are listed in the order of their stability. Mendon silt loam being the most resistant. The data indicate that all linings will require a protective covering of such materials as rock or gravel if to be used as linings in channels having velocities greater than 1-1/2 feet per second. A study of the velocities at which gravel is stable indicates that a covering of 1 to 2 inch gravel will provide adequate protection against erosion in canals of average velocity. The permissible velocities for gravel as determined were in good agreement with those previously published by Fortier and Scobey."

Maughan reports-"During August a trip was made to Millard County in connection with institutional aspects of drainage in that area. Following World War I four drainage districts were set up to drain a little more than 80,000 acres near Delta. It is now conceded that these drainage systems were over extended. Much land was included which was never brought under cultivation. Only about half the original drained area is now under irrigation and devoted to cultivated crop production.

"A principal result of the attempted drainage of the large uncultivated acreage was to throw the cost of the systems on a much smaller productive area. This soon resulted in financial failure of all four districts. It took nearly a quarter of a century to work out the resulting financial and legal problems and clear the districts of their defaulted debts. Losses to bondholders and to debtors were widespread.

"Much drainage litigation developed in this area out of which came a number of notable court decisions. Most outstanding decision, finally sustained by the Supreme Court of the United States, was rendered in the case of Millard County, a municipal corporation of the State of Utah, and Parker Robinson vs Millard County Drainage Districts 1, 2, 3, and 4, et al. In the decision it was stated 'The court further finds that the lien of county, county school, and town and city taxes constitutes a prior and superior lien to the lien of drainage district taxes and assessments, whether the same be prior in point of time or

*Thesis presented by Mr. Norman A. Evans in partial fulfillment for the M. S. Degree in Agricultural Engineering. A copy is on file in the U.S.A.C. Library.

otherwise.' Thus, an auditors deed for delinquent state and county taxes has the effect of wiping out all drainage district obligations, including bonds against the land up to the time of tax sale. Ultimately much of the drained land in the Delta area was cleared of bonded debt by this device. When the foregoing decision was rendered much of the land was already delinquent in state and county, as well as drainage district taxes. Considerable land had already gone to tax sale, at the end of legal period of 4 years tax delinquency. Additional land soon followed in this process of wiping out drainage obligations

"Other means were also used to settle the bonded debt on individual farms. A second court decision declared that there was no 'Blanket Lien Liability' in drainage districts organized under the Utah law. It was thus possible to clear individual farms by purchase and retirement of bonds equal to the assessed benefits against the land. Many farmers used this means, buying bonds now available at a small percentage of their face value, and turning them in to the County Treasurer, to clear their farms. By these means the bonded indebtedness of our districts in the Delta area has now been practically liquidated."

Karl Harris reports-"Spent 10 days running infiltration rates on plots where gypsum, sulphur, barnyard manure, green manure and different types of seedbed preparation had been made. The results would indicate that the soil amendments had but little influence on rate of water infiltration. The plots irrigated twice and disked after each irrigation reduced the rate of infiltration more than soil amendments."

Water Use and Application - "The final revision has been made by Mr. Criddle of his manuscripts entitled: 'A Practical Method for Determining Length of Runs, Size of Furrow Streams, and Spacing of Furrows on Irrigated Land,' and 'Estimate of Water Requirements of Crops in Irrigated Areas in Idaho'

'Also Mr. Criddle has reviewed consumptive use figures for various sources with an idea of including them in the proposed revision of the mimeographed paper by Blaney and Criddle entitled 'A Method of Estimating Water Requirements in Irrigated Areas from Climatological Data.'

R. L. Parshall, Ft. Collins, Colo., reports-"Continued work at the Bellvue laboratory in connection with the study of the model riffle deflector-vortex tube sand trap intended for construction in the Consolidated Irrigation Canal at Selma, Calif. Because of previous experiments on this type of sand trap, the present model, of course, functions in a similar manner as to previous settings. Because of the expense involved in the construction of this large sand trap structure, together with a reinforced concrete 40-foot Parshall measuring flume, and as the matter of economy of construction is an item of foremost consideration, therefore to develop the final plans to provide a highly efficient sand trap and at the same time reduce expense, new ideas have been incorporated in the model with these points in view, namely, the collecting compartment receiving the bed load from the short vortex tube is now proposed to be of 48-inch reinforced concrete pipes, one set upon the other vertically, making a well about 12 feet deep. These cylindrical wells would be spaced about 10 feet center to center and each to receive the bed load through the tubes at the base on each side. Short connecting pipes,

18 and 24 inches in diameter, connect each well at the base, all diverting through a common 36 inch concrete pipe outlet to the river. In this connection a new design of short vortex tubes is being proposed, one to be fabricated out of 10 gage sheet metal sufficiently welded to be placed at the base of the structure and there concreted in position. The nature of this vortex tube being parabolic in plan made it practically impossible to cast concrete tubes because of the complicated form necessary to cast such an irregular design.

J. H. Stockwell, Ft. Collins, Colo., reports-"For practically the entire State of Colorado the water supply this year has been especially good. For northern New Mexico and the North Platte drainage in Wyoming it has been the best in several years. The carry-over of supply in the Seminole, Casper-Alcova, Pathfinder and Guernsey reservoirs on the North Platte in Wyoming will be at least 1,000,000 acre-feet, thus insuring the irrigation water supply along the North Platte River during the season of 1948. It is likely that there will be a substantial carry-over in Colorado reservoirs, especially in the lower South Platte and the Poudre drainage.

10/7/47

